R. v. Awer and the Dangers of Science in Sheep's Clothing

Jason M. Chin and Scott Dallen

1. Introduction

Canadian courts regularly affirm their commitment to gatekeeping scientific evidence, saying it is fundamentally important to determine the admissibility of such evidence before it can impact the ultimate decision.¹ The significance of gatekeeping is underscored by the fact that unreliable science has been at the heart of many high-profile wrongful convictions.² In fact, a leading study demonstrated that invalid forensic science was present in approximately 60% of wrongful convictions.³

But while pronouncements of commitment to gatekeeping are laudable, they are empty if not rigorously followed. In fact, a recent trend has seen a more permissive approach take hold, with scientific evidence characterized as “specialized knowledge”, and evaluated primarily on the basis of the expert’s qualifications. Exacerbating this issue, trial judges sitting alone are regularly more permissive in their gatekeeping role than those sitting with a jury.

1. For example, *R. c. J. (J.)*, [2000] 2 S.C.R. 600, (*sub nom.* *R. v. J. (J-L.)*) 148 C.C.C. (3d) 487, 37 C.R. (5th) 203 (S.C.C.), at para. 28; *R. v. Mohan*, [1994] 2 S.C.R. 9, 89 C.C.C. (3d) 402, 29 C.R. (4th) 243 (S.C.C.), at para. 23 (*Mohan*); *Meady v. Greyhound Canada Transportation Corp.* (2015), 329 O.A.C. 173, 16 C.C.L.T. (4th) 55, 72 M.V.R. (6th) 213 (Ont. C.A.), at para. 37; *White Burgess Langille Inman v. Abbott and Haliburton Co.*, [2015] 2 S.C.R. 182, 18 C.R. (7th) 308, 383 D.L.R. (4th) 429 (S.C.C.), at paras. 1, 16-20 (*White Burgess*).
2. Fred Kaufman, *The Commission on Proceedings Involving Guy Paul Morin* (Toronto: Ontario Ministry of the Attorney General, 1998), at pp. 83-403, 1093 (Kaufman); Stephen T. Goudge, *Inquiry into pediatric forensic pathology in Ontario* (2008) Retrieved from <<http://www.attorneygeneral.jus.gov.on.ca/inquiries/goudge/report/index.html>>, at p. 5 (Goudge); and for a review see David Paciocco, “Taking a ‘Goudge’ out of Bluster and Blarney: an ‘Evidence-Based Approach’ to Expert Testimony” (2009), 13 Can. Crim. L.R. 135, at pp. 136-140.
3. Brandon L. Garrett & Peter J. Neufeld, “Invalid Forensic Science Testimony and Wrongful Convictions” (2009), 95 (1) Va. L. Rev. 1 (Garrett).

Both trends, which insulate scientific evidence from scrutiny, came to a head in a recent 2-1 decision of the Alberta Court of Appeal. In this case, *R. v. Awer*, the Crown's expert presented a theory about DNA transfer supported by his own previous informal observations and journal articles penned by a police crime lab (and of questionable reliability).⁴ Despite the Crown's characterization of the expert's testimony as science, the majority of the Court of Appeal characterized it as specialized knowledge, and refrained from any inquiry into how the expert performed his tests, his sample size, or any controls for bias. Similarly, despite characterizing the journal articles as science, the majority did not scrutinize them at all. As a result, two highly prejudicial forms of evidence were allowed to impact a critical legal decision with no analysis as to their reliability.

(a) Canadian Scientific Evidence Law

Scientific evidence, like expert opinion evidence writ large, is presumptively inadmissible. The party proffering the evidence must establish its admissibility on a balance of probabilities. Admissibility is determined by way of a two step analysis.⁵ At the first step, the proponent of the evidence must establish admissibility on the basis of the four factors from *R. v. Mohan*: logical relevance, necessity, absence of an exclusionary rule, and a properly qualified expert.⁶ The Supreme Court in *White Burgess* recently clarified the approach when the proffered evidence is also novel or contested scientific evidence. In such cases, the proponent must also establish the reliability of the scientific methodology at the first stage.

At the second stage of the analysis, the trial judge balances the benefits of the evidence against its risks.⁷ Scientific reliability may be considered at this second stage as well, with courts determining whether the reliability of the evidence outweighs any potential prejudice it may introduce into the trial. This prejudice is typically conceptualized as the persuasive sway scientists command over lay triers of fact: surrounded by the "mystique of science",⁸ the expert can exert a great deal of influence.⁹

4. *R. v. Awer* (2016), 29 C.R. (7th) 118, 2016 CarswellAlta 827, [2016] A.J. No. 457 (Alta. C.A.), leave to appeal to SCC granted (*Awer ABCA*); *R. v. Awer* (October 29, 2014), Doc. 130891062Q1 (*Awer Trial*).

5. *White Burgess*, *supra*, footnote 1, at para. 22; *R. v. Abbey* (2009), 246 C.C.C. (3d) 301, 68 C.R. (6th) 201, 97 O.R. (3d) 330 (Ont. C.A.), at para. 76, leave to appeal refused [2010] 2 S.C.R. v (note), 276 O.A.C. 398 (note), 409 N.R. 397 (note) (S.C.C.) (*Abbey*).

6. *Mohan*, *supra*, footnote 1, at paras. 17-32.

7. *White Burgess*, *supra*, footnote 1, at para. 24.

To assess scientific reliability, Canadian courts have, since *R. v. Mohan*,¹⁰ referred to the factors found in the leading U.S. case on the admissibility of scientific evidence, *Daubert v. Merrell Dow*.¹¹ Under *Daubert*, scientific evidence is evaluated on (1) whether and how the science was tested, (2) the error rate associated with the science, (3) whether and how the science has been peer reviewed and published, and (4) whether the science has reached general acceptance in the scientific community from which it comes.

(b) Science in Sheep's Clothing

Rather than engage in a thorough *Daubert-Mohan* analysis, some courts have preferred to characterize evidence from scientific fields as specialized knowledge, and thus subject it to a more lenient standard focused on the expert's qualifications. Academics have decried this practice, terming it "at best, lackadaisical and, at worst, disingenuous".¹² We suggest that the majority in *Awer* endorsed this approach. In particular, neither the trial judge (sitting without a jury), nor the majority of the Court of Appeal, inquired into the methodology behind the Crown expert's opinion. In the following section we provide a more detailed summary of *Awer* with an eye towards the primary scientific evidence issues. Part III discusses the approach to scientific evidence that insulates it from scrutiny by labeling it specialized knowledge, and the dangers related to that

8. *JLJ*, *supra*, footnote 1, at para. 55; *R. v. McIntosh* (1997), 117 C.C.C. (3d) 385, 35 O.R. (3d) 97, 102 O.A.C. 210 (Ont. C.A.), at para. 17, leave to appeal refused [1998] 1 S.C.R. xii, (*sub nom.* *R. v. McCarthy*) 111 O.A.C. 395 (note), 227 N.R. 279 (note) (S.C.C.).
9. *JLJ*, *supra*, footnote 1, at para. 25; *R. v. Trochym*, [2007] 1 S.C.R. 239, 216 C.C.C. (3d) 225, 43 C.R. (6th) 217 (S.C.C.), at para. 34 (*Trochym*); *White Burgess*, *supra*, footnote 1, at paras. 16-18.
10. See Goudge, *supra*, footnote 2, at pp. 480-487 for a review.
11. *Daubert v. Merrell Dow Pharmaceuticals Inc.*, 125 L.Ed.2d 469, 113 S.Ct. 2786, 509 U.S. 579 (U.S. Cal. Sup. Ct., 1993) at 595 [U.S.] (*Trochym*); e.g., see references to *Daubert* in: *Daubert*, *supra*, footnote 9, at para. 36; *JLJ*, *supra*, footnote 1, at para. 33; *R. v. Pearce* (2014), 318 C.C.C. (3d) 372, 13 C.R. (7th) 270, [2014] 9 W.W.R. 476 (Man. C.A.), at para. 69 (*Pearce*); *R. v. Armour Pharmaceutical Co.*, 2007 CarswellOnt 11565, [2007] O.J. No. 5843 (Ont. S.C.J.), at paras. 22-23 (*Armour*); Much of this trend can be traced to recommendations found in the Goudge Report, Goudge at pp. 480-487.
12. David L. Faigman et al., *Modern Scientific Evidence* (Thomson Reuters, 2015-2016) at § 1:30 (Faigman); See also Emma Cunliffe & Gary Edmond, "Gaitkeeping in Canada: Mis-steps in assessing the reliability of expert testimony" (2013), 92 Can Bar Rev 327 (Cunliffe); Gary Edmond, "Forensic science and conditions for rational (jury) evaluation" (2015), 39(1) Melbourne University Law Review (advance) (Edmond).

approach. Part IV reviews the issue of scientific evidence in bench trials. Finally, in Part V, we suggest solutions to help ensure unreliable science does not impact legal decisions.

2. *R. v. Awer* Summary

(a) The Facts

Awer is a sexual assault case in which the accused, Nihal Awer, hosted a party where the complainant was the sole female attendee among six males. At a certain point in the evening, the complainant began to feel ill and laid down in Awer's bedroom. Toxicology reports indicated she had been drugged.

Evidence of Awer's involvement was tenuous, with an unidentified male more definitely linked to the crime: forensic tests confirmed the presence of bodily fluids on the complainant's body that did not match Awer's DNA profile. This third party sample was referred to as "Male #1".¹³ A swab was also taken from Awer's penis that revealed the presence of three DNA profiles: the complainant's DNA and two smaller samples from unidentified parties. The amount of the complainant's DNA found on Awer's penile swab formed the crux of the Crown's case against him.

The Crown argued that direct sexual contact with a wet source of DNA was the only plausible explanation for the amount of the complainant's DNA found on Awer's swab. The defence suggested that it could have been a result of "secondary DNA transfer", whereby Awer handled a glass, bottle, or towel that the complainant or Male #1 touched, and then touched himself, perhaps while using the washroom.¹⁴

With the DNA transfer method as the primary source of inculpatory evidence, the competing testimony of two expert witnesses took centre stage. The Crown's DNA expert — Mr. Stephen Denison — opined that the amount DNA found on Awer's swab indicated he had come into contact with a wet source of the complainant's DNA: likely either saliva or vaginal secretions. Denison supported his decision with two sources: first, he referenced his own experience measuring DNA transfers, most notably the fact that "he had not seen a dry stain transfer that total amount of DNA";¹⁵ and second, he referenced two published journal

13. *Awer ABCA*, *supra*, footnote 4, at para. 6.

14. *Awer ABCA*, *supra*, footnote 4, at para. 18.

15. *Ibid.*, at paras. 9, 50.

articles suggesting that wet stains transfer more DNA than do dry ones.¹⁶

Unsurprisingly, the defence's expert — Dr. Randell Libby — was more skeptical. He opined that the quantity of the DNA found on Mr. Awer did not support an inference regarding its source: “. . . you cannot put any faith in the absolute quantity of DNA that you detect in determining if that's a primary or secondary transfer. So the quantity of DNA that you obtain is not informative insofar as determining how the — the mode of transfer”.¹⁷ With regard to the secondary transfer theory, Libby testified that it was just as likely that the DNA found on Awer's swab came from a secondary source.¹⁸ Awer had also regularly touched, hugged, and shook hands with the other men in the room, one of whom was likely Male #1.¹⁹

Libby was also dubious of the trade journals upon which the Crown's expert relied. The articles had not been peer reviewed and did not indicate that there is a threshold amount of DNA suggestive of a wet versus dry transfer.²⁰ For the reasons described below, the trial judge preferred Denison's evidence and found Awer guilty.

(b) The Majority

The primary issues on appeal were the admissibility of the expert DNA evidence and the weight the trial judge afforded it. With regard to admissibility, the majority enunciated a tripartite standard: (1) established field of knowledge opinion evidence, (2) novel science opinion evidence, and (3) personal life experience opinion evidence.²¹ In defining what they meant by established evidence, the majority said that it came from an established field of knowledge, such as “science or medicine”.²² In the majority's view, novel science is knowledge which has not yet been established, but capable of scientific evaluation.²³ Finally, the majority's personal life experience category encompasses two types of evidence that are not typically collapsed together: specialized knowledge (*e.g.*, forensic science), and lay knowledge (*e.g.*, recognition of a person known to the witness).

The majority explained that these categories should receive varying degrees of scrutiny as to their admissibility. Established

16. *Awer Trial*, *supra*, footnote 4, at paras. 166-168, 254.

17. *Awer ABCA*, *supra*, footnote 4, at para. 113.

18. *Ibid.*, at paras. 113, 120.

19. *Ibid.*, at para. 15.

20. *Ibid.*, at para. 10.

21. *Ibid.*, at paras. 32-35.

22. *Ibid.*, at para. 32.

23. *Ibid.*, at para. 31.

field of knowledge opinion evidence, can be evaluated based on the standard *Mohan* framework.²⁴ Novel science deserves more scrutiny.²⁵ Finally, experiential evidence (both lay and specialized) deserves the least amount of scrutiny, with the majority holding: “this sort of evidence is unlikely to have any prejudicial effect in the true sense of the concept of prejudice, so there is arguably no basis for gatekeeping”.²⁶

The majority went on to characterize Denison’s evidence as a combination of novel science and personal experience evidence (*i.e.*, specialized knowledge). Denison’s reliance on published studies was the novel component and his statement that, in his practice, dry transfers involving of the amount found on Awer were impossible, was personal experience evidence. The majority then drew an extended analogy to the Court of Appeal for Ontario’s decision in *R. v. Abbey*. In *Abbey*, the Ontario Court of Appeal found it was inappropriate to hold all expert opinion evidence to the *Daubert* standard.²⁷ Instead, non-scientific expert evidence should be held to a more flexible standard focused on the reliability of the witnesses’ methods and qualifications (In *Abbey*, the impugned expert evidence concerned sociological case study research regarding the meaning of teardrop tattoos among gang members).²⁸

(i) Admissibility of Evidence

Despite the earlier review of *Abbey* and the statement that novel science should be subjected to the *Daubert* standard, neither case was expressly applied to the evidence. Instead, Denison’s comments about DNA transferability were considered to be factual assertions (rather than opinion) and thus not subject to the rules regarding admissibility.²⁹ The articles were admitted because they were not proffered for the truth of their contents (*i.e.*, hearsay), but merely because they were referred to by Denison.³⁰

(ii) Weight of Evidence

Finally, the majority of the Court of Appeal considered the weight

24. *Ibid.*, at para. 32.

25. *Ibid.*, at paras. 33-34, where the majority cites the *Daubert* factors without citing *Daubert* in name. But note that they do not go on to apply these factors to the evidence.

26. *Ibid.*, at para. 35, although we wonder if this logic holds when the expert is a scientist – the potential for prejudice in such cases appears to be high.

27. *Abbey*, *supra*, footnote 5, at para. 116.

28. *Ibid.*, at paras. 112-126.

29. *Awer ABCA*, *supra*, footnote 4, at para. 53.

30. *Ibid.*, at paras. 62-68.

the trial judge assigned to both experts' testimony.³¹ With regard to Denison's evidence, the majority found that there was no error: They reiterated, at several points, the convention that trial judges should be afforded broad discretion in matters of weight.³² Similarly, the majority deferred to the trial judge's decision to discount Libby's evidence because he was equivocal and, at times, unresponsive.³³

(c) The Dissent

Justice Berger, in dissent, stated that the trial judge did not properly exercise her gatekeeper role with regard to Denison's evidence because it was not clear if Denison's observations were systematic, if they involved appropriate sample sizes, and if they met acceptable standards for error rates.³⁴ As for Libby's evidence, Justice Berger would have assigned it greater weight. In particular, and unlike the majority, he found that Libby's testimony was both useful and straightforward.³⁵ Justice Berger suggested that the trial judge may have been frustrated with Libby because he was unable to provide the "ready-made inference" the trial judge expected.³⁶

3. Science or Specialized Knowledge?

The linchpin of the Crown's case was Denison's opinion that the amount of DNA found on Awer indicated he had been in direct contact with a wet source of the complainant's DNA. The majority of the Alberta Court of Appeal determined that Denison's opinion was based on both his specialized knowledge (*i.e.*, his history of analyzing DNA transfers) and novel science (*i.e.*, the journal articles). This distinction is important because novel science is typically subjected to the *Daubert* test, which looks into the testing, error rates and peer review behind the science.³⁷ Specialized knowledge, on the other hand, is subject to the more flexible inquiry prescribed in *Abbey*, with less attention to testing.

Citing *Abbey*, the majority went on to apply both components of

31. *Ibid.*, at para. 72.

32. *Ibid.*, at paras. 73, 77-78.

33. *Ibid.*, at paras. 76-78.

34. *Ibid.*, at para. 127.

35. *Ibid.*, at para. 120.

36. *Ibid.*, at para. 121.

37. *Daubert*, *supra*, footnote 11, at paras. 592-593. *Trochym*, *supra*, footnote 9, at para. 36; *JLJ*, *supra*, footnote 1, at para. 33; *Pearce*, *supra*, footnote 11, at para. 69; *Armour*, *supra*, footnote 11, at paras. 22-23.

Denison's evidence to an inquiry that focused primarily on Denison's expertise, rather than the reliability of his methods:³⁸

... it is clear that when dealing with "specialized knowledge" expert evidence the focus will be on the reliability of the opinion and *a key factor in that evaluation will be the training and experience of the expert*; put in *Daubert* terms, reasonable reliability of the expert will be a crucial consideration while reasonable reliability of the "specialized knowledge" will be considered as well . . .

In fact, the majority did not engage in any analysis of the reliability of Denison's observations or that of the journal articles.

The majority's characterization of Denison's evidence as specialized knowledge and their focus on his credentials rather than his methodology reflect a problematic trend in scientific evidence law evident in cases of forensic science and police testimony.

(a) *Abbey Road*

The genesis of this trend towards the insulation of scientific evidence from scrutiny can be traced back to the period between *Daubert*'s importation into Canadian case law and *Abbey*. Courts had begun to overextend the *Daubert* analysis.³⁹ This experience mirrored the post-*Daubert* case law in the U.S. where courts were "bedeviled" as to whether *Daubert* applied to non-scientific evidence.⁴⁰ The issue was resolved in the U.S. in *Kumho Tires Ltd. v. Carmichael*⁴¹ and in Canada in *Abbey*. Both held that the *Daubert* factors should be flexibly applied to non-scientific evidence with a focus on the reliability of the expert's methodology.⁴²

(b) Dressing Up Science as Specialized Knowledge

While *Abbey* and *Kumho* are logical extensions of expert evidence doctrine, recent cases have revealed exploits in the flexibility they provide when evidence is characterized as specialized knowledge. This was precisely the issue in *R. v. Aitken*, in which the British Columbia Court of Appeal characterized a field of forensic science as specialized knowledge and only superficially inquired into its reliability.⁴³

38. *Awer ABCA*, *supra*, footnote 4, at para. 43 (emphasis in original).

39. See *R. v. Gratton* (2003), 341 A.R. 201, 23 Alta. L.R. (4th) 214, 43 M.V.R. (4th) 68 (Alta. Q.B.), at para. 122.

40. Faigman, *supra*, footnote 12, at 1:25.

41. *Kumho Tire Co. v. Carmichael*, 29 Env'tl. L. Rep. 20, 638, 143 L.Ed.2d 238, 119 S.Ct. 1167 (U.S. Ala. S.C., 1999) (*Kumho*).

42. *Ibid.*, at p. 1176; *Abbey*, *supra*, footnote 5, at paras. 110-111.

(i) *Forensic Gait Analysis in R. v. Aitken*

In *Aitken*, the court of appeal upheld a murder conviction that relied, in part, on the identification of the accused through CCTV footage. One issue on appeal was the trial judge's decision to admit forensic gait evidence provided by Haydn Kelly, a podiatrist who had given similar evidence in several English cases (but never in Canada). Forensic gait analysis, according to Kelly, is the study of the way in which a person walks as applied to legal problems.⁴⁴ Kelly opined, based on a comparison of CCTV images of the shooter and recordings of Aitken, that Aitken's gait bore a "very strong likeness" to that of the shooter.⁴⁵

Despite the Crown's admission that Kelly's analysis was scientific,⁴⁶ Justice Hall, writing for the Court of Appeal, found that Kelly's analysis was "specialized knowledge gained through experience and specialized training."⁴⁷ Justice Hall supported his opinion with the observation that podiatry (but not forensic gait analysis) had been in existence for a thousand years,⁴⁸ and forensic gait analysis was regularly admitted into English courts.⁴⁹

As a result of the special knowledge characterization, Justice Hall did not subject Kelly's evidence to *Daubert*'s four factors.⁵⁰ Instead, he adverted to the analysis in *Abbey*, and in particular, Kelly's specialized training and expertise as a proxy for reliability. However, as Emma Cunliffe and Gary Edmond note, forensic gait analysis is a comparative exercise, akin to DNA, fingerprint and ballistic analysis. The forensic scientist makes a comparison between a sample taken from a population of interest (in *Aitken*, the CCTV images) and a sample from a known source (video of the accused).⁵¹ Multiple sources,⁵² including an authoritative report by the U.S. National Academies of Science (NAS), forcefully recommend that forensic science should be held to the *Daubert* standard.⁵³

43. *R. v. Aitken* (2012), 289 C.C.C. (3d) 79, 92 C.R. (6th) 384, 542 W.A.C. 125 (B.C. C.A.), leave to appeal refused (2013), 451 N.R. 397 (note), 587 W.A.C. 322 (note), 344 B.C.A.C. 322 (note) (S.C.C.) (*Aitken BCCA*); *R. v. Aitken*, 2008 CarswellBC 3329, [2008] B.C.J. No. 2858, 2008 BCSC 1423 (B.C. S.C.) (*Aitken Trial*).

44. Cunliffe, *supra*, footnote 12, at p. 333.

45. *Aitken BCCA*, *supra*, footnote 43, at para. 64.

46. Cunliffe, *supra*, footnote 12, at p. 335.

47. *Aitken BCCA*, *supra*, footnote 43, at para. 81.

48. *Ibid.*, at para. 74.

49. *Ibid.*, at paras. 87-96.

50. *Ibid.*, at para. 80.

51. Cunliffe, *supra*, footnote 12, at p. 351.

52. See the sources cited at *supra*, footnote 12.

The NAS Report described an absence of research validating many forensic techniques and courts' willingness to admit such evidence regardless of this lack of testing.⁵⁴ It reviewed several important components of the validation process, such as systematic testing in a manner in which the experimenters are blind to the hypothesis,⁵⁵ replication of those tests by independent laboratories,⁵⁶ peer review and publication of findings,⁵⁷ and rational assessment of the error rates associated with the testing.⁵⁸ These recommendations largely mirror the *Daubert* test.

Cunliffe and Edmond subjected Kelly's technique to the NAS Report's guidelines for validation of forensic methodologies and found it came up well short. For example, Kelly, under cross-examination, admitted that his methodology had not been subjected to blind testing.⁵⁹ This lack of testing makes any estimate of error rate impossible. Further, Kelly's methodology had not been peer reviewed or published⁶⁰ and was thus not subject to replication studies by independent laboratories.⁶¹

Despite Kelly's failure to validate his methodology, and despite his assertion that his method was scientific, both the trial judge and appellate court found that his opinion was admissible under *Abbey*. Both courts supported their decision to admit Kelly's evidence by reference to his credentials and experience.⁶² *Abbey* however, does not dispense with a reliability analysis, requiring more than a review of the expert's CV. In *Abbey*, Justice Doherty listed several factors that may be used to assess specialized knowledge evidence, such as the methods for making observations and the degree to which the methodology had been peer reviewed.

53. National Research Council, *Strengthening Forensic Science in the United States: A Path Forward* (Washington, DC: National Academies Press, 2009) (NAS Report).

54. *Ibid.*, at p. 53.

55. *Ibid.*, at pp. 113-116.

56. *Ibid.*, at p. 114; Jason M. Chin, "Psychological science's replicability crisis and what it means for science in the courtroom" (2014), 20:3 *Psychology, Public Policy and Law* 225 (Chin); Jason M. Chin, "What irreproducible results mean for the law of scientific evidence" (2016), 35:1 *The Advocates' Journal* 17.

57. NAS Report, *supra*, footnote 53, at p. 114.

58. *Ibid.*, at pp. 116-122.

59. Cunliffe, *supra*, footnote 12, at p. 338.

60. *Ibid.*, at p. 340.

61. *Ibid.*

62. *Ibid.*, at pp. 349-356.

(ii) Police Experts

The issue of scientific versus specialized knowledge evidence also regularly arises in cases where the Crown attempts to prove the accused possessed a drug with the intent to traffic it. In such cases, a police officer is often called as an expert witness for the Crown to opine on various drug-related issues, including the habits of drug users (e.g., frequency and volume of consumption) and the habits of drug dealers (e.g., packaging and pricing of drugs for sale). This evidence is ultimately used by the Crown to demonstrate that the accused's actions were more in line with that of a dealer than that of a user. The defence, on the other hand, offers the theory that the accused's possession of sizable amounts of drugs also fit the habits of an addict.

Until recently, courts across Canada generally agreed that police testimony regarding the habits of drug dealer were within the specialized knowledge of police called as experts (assuming the other criteria in *Mohan* are met),⁶³ whereas the habits of drug users and addicts were the domain of scientific evidence. The Newfoundland and Labrador Provincial Court, for example, drew this distinction quite clearly:⁶⁴

The portion of Sergeant Scott's evidence which was about patterns of consumption and the amount of narcotics typically consumed by a drug user or addict would clearly be within the expert purview of people trained in addictions and or pharmacology or a related scientific field. Quite obviously the officers evidence does not come close to meeting the standards set out in *Daubert* (*supra*) or *R. c. J. (J.-L.)* (*supra*) for admission as reliable scientific evidence based as it is on anecdotal evidence and not on empirical research.

Courts in Manitoba,⁶⁵ Alberta⁶⁶ and Ontario⁶⁷ have come to similar conclusions. For instance, The Alberta Court of Appeal excluded a police officer's evidence regarding the amount of crack that addicts typically use because, among other reasons, the detective's methodology was unreliable. In particular, the court

63. *R. v. Sekhon*, [2014] 1 S.C.R. 272, 307 C.C.C. (3d) 464, 8 C.R. (7th) 223 (S.C.C.), at para. 76.

64. *R. v. Jerrett* (2004), 719 A.P.R. 348, 242 Nfld. & P.E.I.R. 348, 2004 CarswellNfld 358 (N.L. Prov. Ct.), at para. 28.

65. *R. v. Klassen* (2003), [2004] 4 W.W.R. 351, 179 Man. R. (2d) 115, 2003 CarswellMan 467 (Man. Q.B.), at para. 36.

66. *R. v. Jacobs* (2014), 312 C.C.C. (3d) 45, 577 A.R. 3, 613 W.A.C. 3 (Alta. C.A.), at para. 62 (*Jacobs*).

67. *R. v. Mulaj*, 2014 CarswellOnt 10133, [2014] O.J. No. 4405, 2014 ONSC 4405 (Ont. S.C.J.), at para. 46.

questioned the detective's sample size and whether it was a representative sample of the population:⁶⁸

And, even were that known and were the trial judge satisfied that it represented a sample size that supported the drawing of general inferences on a purely statistical basis about how many users traffic in cocaine and how many are mere consumers, the trial judge did not know whether the appellant — whom she found to be “an intelligent young person, employed in a professional atmosphere” — fit within the category of users with whom Detective Pilon had communicated over the years.

The Alberta Court of Appeal ignored the above line of authority in its 2016 decision in *R. v. Dominic*.⁶⁹ In that case, the court considered the testimony of a police officer opining on the practices and habits of drug users. He testified that users of crack cocaine are addicts and thus purchase small amounts to binge on.⁷⁰ Rather than analyze the police officer's methodology (*e.g.*, where he got his data from, his sample size, if his testing was blind), the court admitted the evidence, finding its probative value was not overcome by its prejudicial effect.⁷¹

(c) Specialized Knowledge in *R. v. Awer*

Aitkin, *Dominic* and now *Awer* reveal a dangerously facile approach towards scientific evidence: admitting it without scrutiny by dressing it up as specialized knowledge.⁷² Denison, the Crown's expert in *Awer*, opined that the amount of DNA found on Awer indicated it was transferred through direct contact with a wet body fluid source because that was the case in previous observations he had

68. *Jacobs*, *supra*, footnote 66 at para. 57.

69. *R. v. Dominic* (2016), 335 C.C.C. (3d) 178, 29 C.R. (7th) 219, 34 Alta. L.R. (6th) 219 (Alta. C.A.) (*Dominic*).

70. *Ibid.*, at para. 12.

71. The court found, at paras. 31-38, that the officer's testimony did not directly lead to the inference that the accused was dealing drugs.

72. Even beyond the specialized knowledge issue, the majority's decision displays a fundamental misunderstanding of scientific evidence doctrine. Recall that the majority determined that Denison's observations were properly admissible as a fact in support of a conclusion, rather than opinion. This was an error in law. Scientific evidence law requires scrutiny of the expert's methodology (*e.g.*, see *JLJ*, *supra*, footnote 1, at para. 50; *General Electric Co. v. Joiner*, 118 S.Ct. 512, 522 U.S. 136, 66 U.S.L.W. 4036 (U.S. Ga. S.C., 1997) at 519 [S.Ct.]). Moreover, forensic scientific opinion is clearly distinguishable from lay factual evidence, see *R. v. Mills* (2014), 1117 A.P.R. 336, 359 Nfld. & P.E.I.R. 336, 2014 CarswellNfld 392 (N.L. Prov. Ct.), at para. 17.

made during his career.⁷³ This opinion, which was central to the decision, fails the guidelines set forth in the NAS Report,⁷⁴ the *Daubert* factors, and, more generally, many of science's best practices.⁷⁵ In particular, Denison's methodology was apparently untested, likely biased, and of dubious precision.

(i) *Testing*

Denison stated that there is an amount of DNA that proves⁷⁶ that there has been "contact with a wet source of DNA",⁷⁷ and that the amount found on Awer met this threshold. He supported this opinion with own experience: "I have not seen a dry stain transfer that total amount of DNA".⁷⁸ This is a form of forensic identification — Denison is saying that he can identify a sample taken from a wet source among samples not taken from such sources. As noted above, the NAS Report recommended that such testing must be systematically validated. Furthermore, when courts have applied *Daubert* to DNA testing,⁷⁹ they have required controlled testing.

Reliance on Denison's observations violate many facets of rigorous scientific testing. For example, Justice Berger, in dissent, lucidly probed Denison's evidence and found it lacked any semblance scientific validity. Berger noted that it was unclear whether Denison's observations were at all controlled: "Were the observations conducted in a systematic manner, following specific protocol and in a controlled environment . . ." ⁸⁰ A review of the trial transcript⁸¹ reveals that Denison did not testify as to whether his previous observations were controlled: Were wet and dry samples collected in the same manner? Were they handled in the same way? Were they preserved similarly?

(ii) *Sample Size*

Justice Berger also questioned Denison's sample size: "How many wet and dry DNA transfers have been witnessed or analyzed . . . Is the

73. *Awer Trial*, *supra*, footnote 4, at para. 96.

74. NAS Report, *supra*, footnote 53, at pp. 113-125.

75. Chin, *supra*, footnote 56.

76. Unlike Kelly, the forensic gait expert in *Aitken*, Denison did not qualify his opinion with a qualitative likelihood estimate, see *Awer Trial*, *supra*, footnote 4, at para. 92.

77. *Ibid.*, at para. 92.

78. *Ibid.*, at para. 103.

79. *R. v. Murrin* (1999), 32 C.R. (5th) 97, 181 D.L.R. (4th) 320, 1999 CarswellBC 3015 (B.C. S.C.), at paras. 77-89.

80. *Awer ABCA*, *supra*, footnote 4, at para. 127.

81. *Awer Trial*, *supra*, footnote 4, at paras. 85-106.

number of transfers observed a sufficient sample size to yield a statistically significant (and thereby reliable) conclusive statement?”⁸² Justice Berger is in good company — within science, a study’s sample size is one of the primary factors used to establish its reliability, with larger samples yielding more precise estimates.⁸³ And these practices reflect legal precedent; courts regularly scrutinize the sample sizes used by experts.⁸⁴

(iii) *Bias*

Did Denison take any steps to free his observations from bias?⁸⁵ While the scientific method is not perfect, it provides a framework that eliminates many sources of bias. For example, even the most regimented thinkers are subject to confirmation bias, or “the seeking or interpreting of evidence in ways that are partial to existing beliefs.”⁸⁶ Without more information, it is impossible to rule out the possibility that preconceptions about the amount of DNA associated with different types of transfers guided Denison’s informal observations. Similarly, Denison’s observation could be what psychologists call a “recency effect” (*i.e.*, more recent observations are remembered better).⁸⁷ Under such a theory, Denison may have simply observed more high-volume wet transfers recently and forgot about the dry transfers he observed years ago. These limitations underscore another issue with Denison’s observations — a lack of openness. Meta-scientific research demonstrates that open methods, such as scientists making their data available to scrutiny, greatly improves the reliability of science.⁸⁸ As it stands in *Awer*, no one can police Denison’s controls, the sufficiency of his sample size, or the rigour of his testing.

82. *Awer ABCA*, *supra*, footnote 4, at para. 126.

83. Uri Simonsohn, “Small Telescopes: Detectability and the Evaluation of Replication Results” (2015), 26(5) *Psychological Science* 550 (Simonsohn).

84. *Abbey*, *supra*, footnote 5, at para. 51; *R. v. Wood*, [2007] 11 W.W.R. 330, 426 A.R. 335, 79 Alta. L.R. (4th) 358 (Alta. Q.B.), at para. 84.

85. *Awer ABCA*, *supra*, footnote 4, at para. 126.

86. Raymond S. Nickerson, “Confirmation Bias: A Ubiquitous Phenomenon in many Guises” 2(2), *Review of General Psychology* 175; see also Alan D Gold, *Expert Evidence in Criminal Law: The Scientific Approach*, 2nd ed. (Toronto: Iriwin, 2009), at p. 98.

87. Norman Miller & Donald T Campbell, “Recency and primacy in persuasion as a function of the timing of speeches and measurements” (1959), 59(1) *The Journal of Abnormal and Social Psychology* 1.

88. Uri Simonsohn, “Just Post It: The Lesson from Two Cases of Fabricated Data Detected by Statistics Alone” (2013), 24 *Psychological Science* 1875.

(iv) Error Rates and Precision

In evaluating Denison's methodology, Justice Berger asked: "Did the court have the benefit of knowing whether observations over time proved to be in error and if so, how frequently?"⁸⁹ Justice Berger appears to be asking whether Denison ever makes the mistake of identifying a wet transfer when in fact the source was dry, and if so, at what rate. This is a perspicacious comment, and it inspires other questions about the precision of Denison's testimony.

Denison, in a manner uncharacteristic of cautious scientific research, expresses little (if any) doubt in his testimony: "based on the total amount of DNA present, it is my opinion that it did not come from contact with a dried skin."⁹⁰ Science's best practices mandate more precision than this. For instance, rather than a statement that the volume of DNA found on Awer passed some unknown threshold, Denison should have been required to provide an estimate for the amount of DNA associated with wet transfers and the error associated with that estimate (i.e., a confidence interval). Research in the field of statistical cognition demonstrates that this presentation allows for more accurate interpretation of statistical information.⁹¹

Similarly, in *Aitken*, commentators took issue with Kelly's determination that the accused's gait bore a "very strong likeness" to the perpetrator. They argued that the trier of fact had no way to value such a rating.⁹² This concern looms large in *Awer*, where a strong conclusion went unsupported by objective data.

(v) Anecdote and Authority

To summarize the "specialized knowledge" evidence in *Awer*, Denison came to a scientific conclusion⁹³ without the benefit of scientific evidence.⁹⁴ In such cases, the trier of fact is left with an opinion presented by an individual surrounded by the "mystique of science",⁹⁵ but without any *indicia* of science on which to evaluate it.

89. *Awer ABCA*, *supra*, footnote 4, at para. 127.

90. *Awer Transcript*, at p. 92 (sic).

91. See Geoff Cumming, "The new statistics: Why and how" (2014), 25 *Psychological Science* 7, at p. 13 (Cumming).

92. Cunliffe, *supra*, footnote 12, at p. 345.

93. The amount of DNA found on Awer exceeded an (unstated) threshold, allowing for the definitive conclusion that it got there through contact with a wet source.

94. Defense counsel attacked these observations as anecdotal evidence, see *Awer ABCA*, *supra*, footnote 4, at para. 50.

95. *JLJ*, *supra*, footnote 1, at para. 55; *R. v. McIntosh* (1997), 117 C.C.C. (3d) 385, 35 O.R. (3d) 97, 102 O.A.C. 210 (Ont. C.A.), at para. 17, leave to appeal

This is the very danger that countless judicial decisions have warned about, and the heart of the issue with pediatric forensic pathology's role in wrongful convictions that prompted Justice Goudge's landmark report:⁹⁶

Anecdotal evidence and authoritative claims based largely on personal experience characterized the experience-based approach, making the opinions reached largely unquantifiable and shielding them from independent verifications.

Furthermore, courts frequently exclude police testimony about drug usage for straying into anecdote — unverifiable, unsystematic observations about consumption patterns.⁹⁷ When excluded, courts note the very shortcomings present in Denison's evidence: untested observations with unstated (and likely low) sample sizes.⁹⁸ In science, the potential prejudice flows from the 'mystique of science', whereas in police cases, it is the "superficial attractiveness"⁹⁹ of a law enforcement authority.

Ultimately, the risk that the trier of fact will uncritically defer to the authority of the expert may have been realized in *Awer*. Neither the trial judge, nor the majority of the Alberta Court of Appeal, entertained any analysis of Denison's methodology. This experience mirrors that in *Aitken* and the criticisms levied against it, in particular that a myopic focus on qualifications of the expert diverted attention from a critical examination of his method.¹⁰⁰

(d) Novel Science: Peer Review and Publication in *Awer*

While Denison's observations were clearly not peer reviewed and published, he did advert to forensic science journal articles that he claimed supported his opinion. The trial judge noted that two were relevant.¹⁰¹ The majority of the Alberta Court of Appeal

refused [1998] 1 S.C.R. xii, (*sub nom.* R. v. McCarthy) 111 O.A.C. 395 (note), 227 N.R. 279 (note) (S.C.C.).

96. Goudge, *supra*, footnote 2, at p. 77.

97. See *Mulaj, supra*, footnote 67; *Jerrett, supra*, footnote 64; *Jacobs, supra*, footnote 66.

98. *Jacobs, supra*, footnote 66; *Klassen, supra*, footnote 65; *Jerrett, supra*, footnote 64.

99. *Mulaj, supra*, footnote 67, at para. 50.

100. Cunliffe, *supra*, footnote 12, at p. 351; see also Bryan Farha, ed., *Pseudoscience and Deception: The Smoke and Mirrors of Paranormal Claims* (Lanham: University Press of America, 2014), at p. 27 (Farha) for a summary of the argument from authority logical fallacy.

101. See *Awer Trial, supra*, footnote 4, at para. 254 for the reference to the articles: Mariya Gouray et al., "Secondary DNA transfer of biological

characterized these journal articles as novel science, but did not subject them to *Daubert*. This decision, which may itself be a mistake, shielded the articles from an inquiry into their reliability.

The defence's expert impugned the journal articles for not representing true peer review because they appeared in what he referred to as a trade journal, and not a high-quality peer reviewed journal.¹⁰² Indeed, publications like these trade journals operate on a pay-to-publish basis,¹⁰³ which creates an incentive for the publisher to publish as many articles as possible, with less concern for reliability and thorough peer review.¹⁰⁴ In a recent study, the author sent a bait study to several pay-to-publish journals.¹⁰⁵ The bait study contained serious and obvious methodological failings. Still, over 50% of these pay-to-publish journals accepted the bait study for publication. These journals represent a real hazard for courts as they appear authoritative, but provide no guarantee of meaning peer review.

And while not a reliability issue *per se*, both studies were performed by a collaboration between the Victoria Police Forensic Service (as first author) and La Trobe University. They take a somewhat partisan slant. For instance, the earlier paper expressly admits the research program was inspired by a desire to parry potential criminal defences:¹⁰⁶

Currently there is limited is limited knowledge concerning conditions that may influence secondary DNA transfer. This ignorance no only limits sampling strategies, DNA interpretations, and case investigations in general, *it could also be easily exploited by defence councils* (sic).

The Supreme Court of Canada has taken a strong stance against experts acting as advocate.¹⁰⁷ There is no logical reason why the science behind an expert's opinion should be any less objective.

In addition, both articles were published in a journal (*Forensic Science International: Genetics*) that did not (and does not) adhere to science's best practices.¹⁰⁸ Notably, the journal does not appear to

substances under varying test conditions" (2010), 4 *Forensic Science International: Genetics* 62 (Gouray); Timothy Verdon et al., "The influence of substrate on DNA transfer and extraction efficiency" (2013), 7 *Forensic Science International: Genetics* 167 (Verdon).

102. *Awer Trial*, *supra*, footnote 4, at paras. 165, 254.

103. Alternatively, the author can pay to make the article open-source, rather than behind a paywall.

104. The fee for open-access publishing in the journal in question is \$3000, see <<http://www.fsigenetics.com/content/authorinfo>>.

105. John Bohannon, "Who's afraid of peer review?" (2013), 342 *Science* 60.

106. Gouray, *supra*, footnote 101, at p. 63 (emphasis added).

107. *White Burgess*, *supra*, footnote 1, at para. 34.

108. Although note that, in response to recent insights into the frailties of many

encourage or require preregistration. Preregistration involves publicly committing to a set of procedures (via various open source scientific databases) prior to conducting the study. This prevents many practices that have demonstrably introduced bias into the scientific literature, including researchers failing to report measures that did not show a significant result and even failing to report studies that did not confirm their hypothesis.¹⁰⁹ Without preregistration, it is difficult to accurately assess the articles Denison relied on in *Awer*. For example, the experimenters may have performed several other studies with negative results or included other conditions and measurements (e.g., different concentrations of DNA) that were ultimately not disclosed in the final report.

Apart from reliability and neutrality concerns, we are also left wondering if the journal articles were relevant. At their absolute best, these articles suggest that wet samples, in some conditions, are more likely to transfer their DNA than dry samples. They do not provide a statement of probability that the complainant's DNA found on Awer's penile swab was the product of direct contact with a wet source. That is simply not what the articles were about. Justice Berger impugned the articles on this very basis.¹¹⁰

The misuse of the articles in *Awer* resembles the experience from the wrongful conviction of Guy Paul Morin. In particular, the commission investigating Morin's wrongful conviction found that a major factor was the Crown's reliance on and misapprehension of a forensic scientific study.¹¹¹ In Morin's case, the impugned study was used to support the Crown's argument regarding the identification of fibers found on the victim's clothes as those found in Morin's car. Ultimately, the commission found that the study was so methodologically and contextually distinct from the facts of the

accepted scientific findings, even leading journals have admitted that they have not always held themselves to the highest standards. For example, *Nature*, a leading scientific journal admitted it had failed to provide for adequate peer review, or even provide enough information such that other researchers could vet the article: "The problems arise in laboratories, but journals such as this one compound them when they fail to exert sufficient scrutiny over the results they publish and when they do not publish enough information for other researchers to assess results properly." Editorial "Announcement: Reducing our irreproducibility" (2013), 496 *Nature* 398.

109. Cumming, *supra*, footnote 91, at p. 4; Chin, *supra*, footnote 56, at pp. 234-236; David C Funder et al., "Improving the dependability of research in personality and social psychology: Recommendations for research and educational practice" (2014), 18 *Personality and Social Psychology Review*, 3-12.

110. *Awer ABCA*, *supra*, footnote 4, at para. 129.

111. Kaufman, *supra*, footnote 2, at pp. 119-139.

case that “properly understood, (it) did not support the case for the prosecution.”¹¹² Similarly, the articles relied on by Denison did not support the Crown’s direct wet transfer theory.

4. Juries and Judges

Judges regularly say that their gatekeeping responsibility for scientific evidence is lessened in bench trials.¹¹³ Justice Lax enunciated this position in *Chan*, suggesting that judges are less likely to be persuaded by science’s mystic infallibility:¹¹⁴

(T)he metaphor of the judge as gatekeeper loses much of its symbolic force when it is the judge who is the trier of fact. This is not to say that a trial judge is excused from scrutinizing evidence as improperly admitted evidence can surely have an impact on a trial, but the likelihood of a judge being overwhelmed by the “mystic infallibility” of the evidence and misusing the evidence to distort the fact-finding process, is far more remote. The dangers that the principles are designed to avoid begin to fall away.

(a) Judges are not Immune to the Persuasive Force of Science

There are at least three reasons why this bifurcated standard to the admissibility of scientific evidence is problematic. First, judges “should not consider inadmissible scientific evidence any more than juries should.”¹¹⁵ While judges appear confident that they are immune to the prejudices associated with scientific evidence (i.e., the quote from Justice Lax above), studies demonstrate that this is not the

112. *Ibid.*, at p. 119.

113. *Chan v. Erin Mills Town Centre Corp.*, 2005 CarswellOnt 6741, [2005] O.J. No. 5027, 143 A.C.W.S. (3d) 1143 (Ont. S.C.J.), at para. 31 (*Chan*); *R. v. Orr* (2015), 18 C.R. (7th) 158, 633 W.A.C. 157, 33 Imm. L.R. (4th) 1 (B.C. C.A.), at para. 62; *R. v. Calnen* (2015), 1160 A.P.R. 118, 368 N.S.R. (2d) 118, 2015 CarswellNS 934 (N.S. S.C.), at para. 29; *R. v. Singh* (2014), 16 C.R. (7th) 95, 122 O.R. (3d) 481, 326 O.A.C. 370 (Ont. C.A.), at para. 78.

114. *Chan*, *supra*, footnote 113, at para. 31.

115. David L. Faigman, Christopher Slobogin & John Monahan, “Gatekeeping science: using the structure of scientific research to distinguish between admissibility and weight in expert testimony” (forthcoming 2016) 110 *Northwestern Law Review* (Faigman); Note also that there are other reasons that have nothing to do with the presence or absence of a jury to exclude bad science: “The Daubert gate not only blocks the entry of unreliable expert testimony in order to protect jurors from being bamboozled, it also protects: (1) opponents from having to muster evidence and resources to counter junk expertise; (2) the judicial system from wasting time and resources; and (3) the integrity of the system from seeming reliance on (or countenance of) bad science.” Faigman at § 1:10.

case. For instance, Andrew Wistrich and colleagues have found that judges are indeed influenced by prejudicial evidence (e.g., privileged conversations, the sexual history of a rape victim).¹¹⁶

And for that matter, what part of a judge's education immunizes him or her from the impressive credentials of a scientific expert? Most commonly accepted models of persuasion suggest that, when out of their depths, individuals give less weight to the content of a message and more weight to the credentials of the speaker.¹¹⁷ There is no reason to expect a judge will have more scientific knowledge than the average juror.¹¹⁸ To the contrary, there may be less reason to believe judges will come from a scientific background because a significant portion of their education was dedicated to legal studies. As a result, lay judges and jurors are likely in the same situation with regard to the persuasive force of expert witnesses. Moreover, trial judges are constrained by time, and their ability to take judicial notice of scientific findings.

(b) Appellate Review Hazards

Second, a bifurcated standard introduces problems at the appellate review stage. Reviewing courts grant deference to trial judges in decisions of weight.¹¹⁹ With both this deference to weight and enhanced deference to judges in bench trials at the gatekeeper stage, the power of a trial judge to determine the impact of scientific evidence on the verdict may reach irrational levels.

Moreover, appellate courts sometimes struggle to determine if weight was given to inadmissible evidence and if that evidence was actually determinative of the outcome. This problem is enhanced in judge-alone trials in which judges liberally admit evidence and simply

116. Andrew J. Wistrich, Chris Guthrie & Jeffrey J. Rachlinski, "Can Judges Ignore Inadmissible Information? The Difficulty of Deliberately Disregarding" (2005), 153 *University of Pennsylvania Law Review* 251.

117. See generally: Elliot Aronson, Timothy D Wilson & Robin M. Akert, *Social Psychology*, 4th ed. (New Jersey: Prentice Hall, 2002), at p. 228; Richard Petty & John T. Cacioppo, *Communication and persuasion: Central and peripheral routes to attitude change* (New York: Springer Science & Business Media, 2012).

118. See generally, the importance of judicial education programs, Glenn T. Harrell Jr. et al., *Deployment of Science and Technology Trained Judges: Settling on a Plan* (Washington DC: Advanced Science and Technology Adjudication Center, 2009).

119. *Awer*, *supra*, footnote 4, at para. 26; *R. v. Clark* (2016), 612 A.R. 372, 662 W.A.C. 372, 2016 CarswellAlta 445 (Alta. C.A.), at paras. 60-61; *Mouvement laïque québécois v. Saguenay (City)*, [2015] 2 S.C.R. 3, 382 D.L.R. (4th) 385, 22 C.C.E.L. (4th) 1 (S.C.C.), at para. 105.

let frailties go to weight. For instance, judges of the Ontario Court of Appeal in *R. v. Singh* carefully parsed the decision at trial but still disagreed over whether the judge placed weight on inadmissible evidence.¹²⁰ Giving proper scrutiny to the evidence at the gate-keeper stage would have obviated this time-consuming exercise.

(c) Problems with Precedent

Finally, the bifurcated approach between judge and jury trials conflicts with the logic of the novel science distinction. Several courts have interpreted novel science as science that has not previously been admitted into courts (*i.e.*, a jurisprudential approach).¹²¹ The bifurcated standard complicates the jurisprudential approach. For instance, trial judges in bench trials may admit scientific evidence not because it is reliable, but because of the absence of a jury. Future courts then may be tempted to admit this science without scrutiny because it seems to have been vetted by previous decisions, and is thus no longer novel. Furthermore, we struggle to understand how the same scientific finding may be found reliable by one court, but unreliable in another in the same jurisdiction, simply due to the presence or absence of a jury.¹²²

(d) The Bifurcated Standard in *Awer*

R. v. Awer was not a jury trial and as a result, the majority at the court of appeal granted the trial judge additional deference.¹²³ For the reasons recounted above, this is problematic. With both enhanced deference at the admissibility and weight stages of the analysis, Denison's evidence was well-protected from appellate review. In fact, the majority stated that it owed the trial judge's determinations of weight deference at least eight times.¹²⁴ With the vast majority of Canadian cases tried by judge alone, this issue is pervasive.

120. *Singh*, *supra*, footnote 113 and see the accompanying case note by Lisa Dufrainmont.

121. *Pearce*, *supra*, footnote 11; *Wood*, *supra*, footnote 84; *R. v. Dimitrov* (2003), 181 C.C.C. (3d) 554, 18 C.R. (6th) 36, 68 O.R. (3d) 641 (Ont. C.A.), leave to appeal refused (2004), 70 O.R. (3d) xvii, 196 O.A.C. 398 (note), 330 N.R. 198 (note) (S.C.C.).

122. And see Faigman, *supra*, footnote 12, at § 1:34: "To allow those matters to be decided one way in one case in one trial court, and differently in another case in another trial court in the same jurisdiction would strike most observers as patently irrational."

123. *Awer ABCA*, *supra*, footnote 4, at para. 56.

124. *Ibid.*, "Trial judges enjoy *wide discretion* when engaged in their role of weighing the costs and benefits of admitting expert evidence . . ." at para. 24;

Several of the trial judge's comments suggest that such deference was misplaced. In fact, much of the trial judge's analysis reflected a misconception of the scientific process, and one that is likely common to both judges and jurors. As Justice Berger noted, the trial judge appeared to prefer Denison's evidence to Libby's because the former provided for a ready-made inference from the evidence.¹²⁵ In fact, and as Justice Berger suggested, science is often initially inconclusive, inspiring more questions than the answers it provides. To prefer an opinion simply because it provides a more facile answer is a misguided approach.

5. A Path Forward and Concluding Discussion

Spending a great deal of time attempting to characterize expert evidence as novel science or specialized knowledge is likely a waste of resources, causing more confusion than good.¹²⁶ In any case, the current approach to the admission of specialized knowledge already requires a reliable basis and consideration of the *Daubert* factors when they are reasonable measures of reliability.¹²⁷ Our recommendations, therefore, reflect scientific evidence law's core principle: scientific evidence is uncommonly persuasive to lay triers of fact, and thus only reliable science should pass the gate.

We offer three propositions: (1) Evidence proffered as science

"it is not open to a reviewing court to carry out its own assessment of the probative value of an expert's testimony or opinions simply because it disagrees with the assessment below..." at para. 25; *"The weight to be given an expert's opinion is within the discretion of the trier of fact and deference is owed on appeal"* at para. 26; *"This exercise of judicial discretion is entitled to considerable deference, in the absence of any error of law, of which none is found here."* at para. 55; *"Assessing the probative value of expert testimony is an evidentiary issue requiring deference . . ."* at para. 57; *"The weight to be given an expert's opinion is within the discretion of the trier of fact. The exercise of such judicial discretion rarely attracts appellate intervention, nor does it in this case."* at para. 73; *"... deference is owed on appeal."* at para. 75; *"The trial judge's assessment of the expert evidence is owed deference on appeal, and there is no basis for interfering with her treatment or weighing of Libby's expert evidence."* at para. 78 (emphasis added in all cases)

125. *Awer ABCA*, *supra*, footnote 4, at para. 121.

126. Cunliffe, *supra*, footnote 12, at pp. 359-361; and see Faigman, *supra*, footnote 12, at § 1:25: "In asking whether the expertise is 'science' or 'non-science,' courts have asked the wrong question."; Goudge, *supra*, footnote 2, at p. 487: "(trial judges) should ensure that expert scientific evidence that does not satisfy standards of threshold reliability be excluded, whether or not the science is classified as novel."

127. *Kumho*, *supra*, footnote 41, at p. 1175: "We conclude that *Daubert*'s general principles apply to the expert matters..."; *Abbey*, *supra*, footnote 5, at paras. 111-119.

should be evaluated as science; (2) evidence susceptible to scientific testing should be tested; and, (3) an expert's *qualifications* alone should never provide a sufficient measure of reliability of his or her *methodology*. These propositions flow from the present Supreme Court of Canada doctrine, which demands methodological reliability from contested science.¹²⁸

(a) Science Should Support Science

At a minimum, evidence presented as science should be supported by replicable scientific methods. By this, we are not speaking to the broader issue of what courts characterize as science, but rather simple fairness: if parties wish to present their evidence as scientific, they should be prepared to demonstrate its scientific reliability. Recall that science is seen as uncommonly persuasive to the eyes of triers of fact (*i.e.*, “mystic infallibility”).¹²⁹ In light of this potential prejudice, science is held to a higher standard than other expert evidence. It stands to reason that if parties wish to present their evidence as science, they should be willing to meet the higher evidentiary burden.

The inequity of taking advantage of science's persuasive power without proving its reliability is part of what made the decision in *Aitken* so objectionable. As commentators noted, the forensic gait expert in *Aitken* repeatedly referred to his method as science, but was not held to a scientific standard of evidence.¹³⁰ Similarly, in *Awer*, the Crown referred to Denison's DNA evidence as science.¹³¹ We admit that this approach is naturally limited because it is easily avoided by an exercise in labeling evidence. In the long run, we expect the following susceptibility approach will be more useful.

(b) The Susceptibility Approach

When courts should require testing is a more difficult question. We agree with an approach in which expert evidence must be tested with reliable methods when it is susceptible to testing.¹³² Some Canadian and U.S. decisions have implicitly accepted this approach by first noting that a conclusion *can be tested* and then demanding that *it indeed be tested*. The most straightforward (but uncommon) instance of this approach occurs when the expert whose evidence has been

128. *White Burgess*, *supra*, footnote 1, at paras. 23-24.

129. See: *JLJ*, *supra*, footnote 1, at para. 25; *Trochym*, *supra*, footnote 9, at para. 34; *White Burgess*, *supra*, footnote 1, at paras. 16-18.

130. Cunliffe, *supra*, footnote 12, at p. 348.

131. *Awer Trial*, *supra*, footnote 4, at paras. 172-173.

132. Cunliffe, *supra*, footnote 12, at p. 361; Faigman, *supra*, footnote 12, at § 1:25.

challenged expressly admits that the science is testable, but has not been tested.¹³³ More frequently, the susceptibility approach can be gleaned when courts note that a particular area of expertise has been tested, but not for the purpose for which it is being proffered. In other words, the court notes that the evidence can best tested — indeed, it has been in other contexts — so therefore it should be tested for the relevant purpose prior to admission.

For instance, litigants regularly attempt to use quantitative EEG (QEEG) evidence to prove brain damage has occurred.¹³⁴ QEEG is a technique that analyzes input from electrodes attached to the patient's head that measure electrical activity. In excluding this evidence, courts note that QEEG has been widely tested in the context of academic scientific research, but not as a way to diagnose brain injuries. In other words, it is testable, but has not been tested for the purpose it was proffered for.¹³⁵ As a result, courts have demanded further testing.

Similarly, courts require reliable testing when they are aware that a finding or technique has received some level of preliminary testing. In other words, if the evidence has been tested in a preliminary fashion, it must be susceptible to testing and thus courts demand more definitive testing before admission. For example, the Alberta Court of Queen's Bench in *R. v. Wood* considered the admissibility of a 12-step test used to determine if an individual is impaired by drugs. The court determined that while it had received some preliminary testing, it had not reached the stage that it was sufficiently reliable to influence legal decisions.¹³⁶ Likewise, in *re Propulsid Product Liability litigation*,¹³⁷

133. *R. v. Palombi*, 2004 CarswellOnt 2926, [2004] O.J. No. 3030, 62 W.C.B. (2d) 432 (Ont. S.C.J.), at para. 17: "He admitted that there are many studies related to his theory that should, but have not yet, been done."

134. *Italy (Republic) v. Seifert*, 2003 CarswellBC 742, [2003] B.C.J. No. 726, 2003 BCSC 501 (B.C. S.C.); *Bialkowski v. Banfield* (2011), 24 B.C.L.R. (5th) 171, 2011 CarswellBC 2026, 2011 BCSC 1045 (B.C. S.C.) (*Bialkowski*); *McGuire v. Risling* (2001), [2002] 3 W.W.R. 533, 212 Sask. R. 149, 2001 CarswellSask 707 (Sask. Q.B.) (*McGuire*).

135. E.g., *McGuire*, *supra*, footnote 134, at para. 10; *Bialkowski*, *supra*, footnote 134, at para. 50.

136. *Wood*, *supra*, footnote 84, at paras. 81-85; see also *Best v. Paul Revere Life Insurance Co.* (2000), 192 D.L.R. (4th) 136, [2000] 10 W.W.R. 441, 49 C.P.C. (4th) 38 (Man. C.A.), at para. 46, in which dental ergonomics had received preliminary field testing but no systematic scientific testing and the experience from *Taylor v. Liong*, [2007] 7 W.W.R. 50, 70 B.C.L.R. (4th) 284, 2007 CarswellBC 347 (B.C. S.C.), in which the causal mechanism relied on by the plaintiff had received research suggesting it was plausible and correspondingly received a thorough judicial vetting as to how it had been tested.

testing was preliminary but not yet conclusive and thus the science was excluded.

Finally, courts have held that conclusions which lend themselves to statistical testing should indeed be tested in that manner, rather than merely eyeballed by an expert. For instance, in *U.S. v. Mikos*,¹³⁸ the U.S. District Court excluded evidence of an analysis comparing the lead found in bullets in the accused's car to bullets recovered from the victim's body. The prosecution's expert opined that given the similarity of the lead composition between the bullets, they must have come from the same batch. In excluding the evidence, Justice Guzman remarked that the expert improperly made a testable probabilistic conclusion, without any actual statistical testing.¹³⁹

An expert opinion can carry a great deal of weight with the trier of fact. For this reason expert opinions must be based upon reliable data. In this case, which involves an opinion as to probability, that means that there must be some basis in support of the opinion that a statistician or mathematician would consider to be at least arguably scientifically valid.

(c) Relevant Expertise is Not Enough

Finally, courts must be wary of accepting an expert's qualifications as a proxy for reliability.¹⁴⁰ This approach was problematic in *Aitken*, diverting the court's attention away from reliability and instead focusing on the expert's CV.¹⁴¹ And presently, scrutiny of Denison's opinion as to the threshold amount of DNA that indicates a wet transfer went no farther than his professional experience.¹⁴² Reliability does not necessarily flow from authority,¹⁴³ and indeed opinions from apparently qualified and respected individuals have resulted in wrongful convictions.¹⁴⁴

137. *In re Propulsid Product Liability litigation*, 261 F.Supp. 603, 208 F.R.D. 133 (E.D. La., 2002).

138. *U.S. v. Mikos*, 2003 WL 22922197 (N.D. Ill. Eastern Division, 2003) (*Mikos*).

139. *Ibid.*, at para. 2; Similarly, in *Zenith Electronics Corp. v. WH-TV Broadcasting Corp.*, 395 F.3d 416, 66 Fed. R. Evid. Serv. 345 (7th Cir., 2005), the impugned damages expert opined on lost profits under various economic scenarios. The Court of Appeals criticized the expert's failure to provide any statistical or quantitative support for his economic opinion: "An expert must offer good reason to think that his approach produces an accurate estimate using professional methods, and this estimate must be testable. Someone else using the same data and methods must be able to replicate the result."

140. Goudge, *supra*, footnote 2, at p. 77.

141. Cunliffe, *supra*, footnote 12, at pp. 349-356.

142. *Awer ABCA*, *supra*, footnote 4, at paras. 45-61.

143. Farha, *supra*, footnote 100.

U.S. courts regularly warn against equating expertise with reliability. In *LinkCo, Inc. v. Fujitsu Ltd.*,¹⁴⁵ the U.S. District Court for the Southern District of New York considered the evidence of a damages expert who made several claims regarding the losses suffered by the plaintiff. The expert supported his testimony by reference to his experience, rather than any systematic study of the industry.¹⁴⁶ The court ordered that the expert revise his report, and in doing so cautioned against arguments from authority: “a court cannot permit experts to ‘offer credentials rather than analysis.’”¹⁴⁷

The Sixth Circuit Court of Appeals’ holding in *Thomas v. City of Chattanooga*¹⁴⁸ regarding the use of expertise as a substitute for reliability is especially relevant to *Awer*. The plaintiff in *Thomas* was shot by the police and argued that it was an instance of excessive force used by the police in Chattanooga. He relied on the report of a criminal justice researcher who opined that the number of complaints filed against the police indicated an unwritten police policy of excessive force. The Court of Appeals followed *Kumho*, holding that a flexible application of *Daubert* was appropriate because the evidence was not based in hard science.¹⁴⁹ But this approach is not so flexible as to simply allow the expert to rest on his experience:¹⁵⁰

(i)f the witness is relying solely or primarily on experience, then the witness must explain how that experience leads to the conclusion reached . . . and how that experience is reliably applied to the facts. The trial court’s gatekeeping function requires more than simply ‘taking the expert’s word for it.’

The Court of Appeal did not take the expert’s word for it. They noted that the expert stated “‘there’s no bright line or rule’ regarding how many complaints would be excessive”.¹⁵¹ This concern harkens back to *Awer*, in which the Crown’s expert could not say what amount of DNA indicated contact with a wet source, but only that, in his experience, the amount found on the accused was sufficient. The Court of Appeal in *Thomas* held that experience in such cases is not enough.

144. Goudge, *supra*, footnote 2; Cunliffe, *supra*, footnote 12, at p. 110; Kaufman, *supra*, footnote 2, at pp. 84-85.

145. *LinkCo, Inc. v. Fujitsu Ltd.*, 2002 WL 1585551 (S.D. N.Y., 2002) (*LinkCo*).

146. *Ibid.*, at para. 4.

147. *Ibid.*, at para. 4.

148. *Thomas v. City of Chattanooga*, 398 F.3d 426, 66 Fed. R. Evid. Serv. 516, 2005 Fed.App. 0061P (6th Cir., 2005) at 433 [F.3d] (*Thomas*).

149. *Ibid.*, at p. 432.

150. *Ibid.* (emphasis added).

151. *Ibid.*

6. Conclusion

In *Awer*, the Crown linked the accused to the complainant on the basis of DNA found on a swab of his penis. Mr. Denison, the Crown's expert, opined that due to the amount of DNA found on Awer, he must have come into direct contact with a wet source of her DNA. This opinion was based on his previous DNA sampling experiences, which ostensibly involved a number of wet and dry DNA transfers, and journal articles concerning the amount of DNA that various dry and wet stains transfer.

Both the trial judge and the majority of the Alberta Court of Appeal demonstrated a markedly facile approach to evaluating the reliability of Denison's evidence. Characterizing Denison's previous observations as specialized knowledge, the court of appeal did not inquire into how those observations were made, how many of them occurred, and how much error was associated with them. Instead, the court remarked that the observations were admissible as facts in support of a conclusion, despite both Canadian and U.S. Supreme Court precedent to the contrary. And although the majority did characterize the journal articles as science, they made no attempt to determine their reliability.

Scientific evidence law is based on the premise that science is remarkably persuasive to lay triers of fact. As a result, only reliable science should be allowed to pass the gate and impact the ultimate decision faced by the trier of fact. *Awer* represents the continuation of a trend that betrays this principle. Courts appear to be admitting scientific evidence as specialized knowledge, giving only passing attention to the reliability of the evidence and instead relying on the expert's experience and reputation. This trend is exacerbated in judge-alone trials, where judges have additional discretion to admit otherwise inadmissible scientific evidence. Focusing on the expert's credentials rather than methodology doubles down on science's aura of authority without providing any insights into its reliability.

We believe that the challenges that arise in cases like *Awer*—cases in which scientific evidence is of deep relevance to the ultimate decision—are surmountable. *Awer* itself is relatively straightforward, with the Crown attempting to take advantage of its expert's scientific background, without proving his scientific reliability at all. Moreover, the questions Denison opined on were clearly testable—they had indeed been tested, just poorly. However, we echo leading scientific evidence scholars in noting that not all cases are so clear.¹⁵²

152. See Faigman, *supra*, footnote 12, at § 1:25: “But the scientific arsenal

Instead of focusing on hard and fast distinctions (*e.g.*, specialized knowledge versus novel science), courts should attend to the principles that animate scientific evidence law. Unreliable evidence should not influence the ultimate legal decision. Arguments from authority should be avoided because the expert's apparent authority is the very danger the law seeks to diminish. And finally, when a question lends itself to scientific testing, courts should demand such testing.

contains a battery of weapons that can be brought to bear on this question, methods that have far greater power than the relatively myopic perspective of casual observation. Whether the courts should expect, or should demand, that these methods be brought to bear to answer particular legally relevant issues is a matter of policy. Therein lies the challenge. Courts must develop an understanding of the appropriate ways to ensure the reliability of different types of expertise."